
USAF Evolved Expendable Launch Vehicle (EELV)

Transition Plan

2 Nov 2000

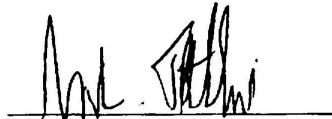


U.S. AIR FORCE


Approval


SAF/AQ

6 Nov 00
DATE


SMC/CC

6 Nov 2000
DATE


AFSPC/CV

3 Nov 00
DATE

Executive Summary

The USAF spacelift community developed this transition plan to widely disseminate its vision of the EELV end-state and describe the management approach the Air Force will use to build confidence in EELV systems. The plan:

- Sets top level ground rules, assumptions, and objectives
- Defines the transition time frame and end-state
- Outlines flight readiness/worthiness approach
- Identifies and resolves major cross-cutting issues
- Identifies resource requirements
- Delineates major roles, responsibilities and accountability

Where appropriate, it describes how the Air Force has implemented the Presidential-directed Launch Broad Area Review (BAR) and SECAF-directed EELV Joint Assessment Team (JAT) recommendations.

The EELV Transition Plan is intended to facilitate EELV implementation by ensuring all government stakeholder roles and concerns are fully represented and integrated into a single product. By establishing roles, responsibilities, and accountability for principal government organizations, it provides essential constraints and guidance for subsequent detailed planning (e.g. budgeting, resource planning, training). Because the EELV transition extends through FY2006, this plan will need to be modified as processes are refined and the community gains experience with this new capability.

The plan briefly describes the EELV life cycle starting in the launch vehicle factories and continuing up to on-orbit delivery of government payloads. It is a top-level description of who will do what and how they will do it. Whenever possible it provides references for those readers whom require greater detail.

For the foreseeable life of the EELV program, responsibility for launch missions performance remains with the launch service providers. However, the government will be an active, value-added partner with the launch contractors in all aspects of commercial and government EELV launch campaigns. Government and contractor personnel will work side-by-side in integrated teams to ensure a single standard of quality and an integrated mission assurance approach for all missions. Initial government involvement in EELV launch campaigns will be similar to that for current commercial heritage systems. Also, for initial EELV government flights there will be extensive government participation in system engineering, product assurance, mission integration, readiness review, surveillance of assembly, test and security, as well as launch and recovery operations. As confidence in the EELV system is established, government roles and needed participation will be reassessed.

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1. Introduction

US spacelift requirements have changed significantly from a decade ago when the majority of the spacelift customers and systems were developed to support government agencies. Today, the customer base is a more balanced mixture of government and commercial customers. In this environment, reliable space access is as important to US commercial market place interests as it is to national security interests.

Growth of commercial market demand for reliable cost-effective spacelift in the mid-1990s encouraged launch vehicle contractors to modify their current launch system designs and corporate strategies to remain viable in today's highly competitive spacelift market place. Launch system contractors streamlined and shortened launch campaign timelines and reduced the overall cost of space launch. They evolved their designs, dramatically reduced part counts and manufacturing cycle times, increased redundancy, and adopted a commercial launch services approach while working to increase launch system reliability

The EELV Program takes advantage of this new competitive market place by further evolving the contractors' commercial practices, processes, and products through the use of competitively awarded, cost sharing, development agreements and launch services contracts. Structured to leverage the numerous benefits of growing commercial market demand for spacelift, these agreements and contracts allow the government to:

- Provide assured access to space
- Effectively partner with industry to enable the US to right-size its spacelift capability
- Ensure the delivery of reliable, cost effective, end-to-end, commercial launch services and reduced launch site O&M

1.1. Purpose

This transition plan describes the Air Force's management approach to implementing the EELV program. It provides a top-level description of the government's involvement consistent with the approved Operational Requirements Document (ORD) and the Acquisition Strategy to implement the ORD. This plan:

- Sets top level ground rules, assumptions, and objectives
- Defines the transition time frame and end-state
- Outlines flight readiness/worthiness approach
- Identifies and resolves major cross-cutting issues
- Identifies resource requirements
- Delineates major roles, responsibilities and accountability

1.2. Goal and Objectives

The goal of this plan is to complete and widely disseminate a transition end-state and lay out the management approach to building confidence from the beginning of the EELV Program. The plan seeks to assure that the government understands its roles and responsibilities. Detailed implementation plans shall be developed to further refine specific aspects of the EELV program (e.g., OSS&E plan, Risk Management Plan, etc.).

The objectives of this plan are to:

- Clearly define the transition period from Heritage launch operations to reliable EELV launch services
- Identify the transition end-state and key milestones
- Integrate launch transition planning and activities among government stakeholders
- Coordinate launch transition planning across the extended launch community of government agencies and industry

1.3. Ground Rules and Assumptions

During development and planning of the transition activities, the EELV stakeholders agreed to the following ground rules and assumptions:

- 1) The requirements of the EELV ORD remain valid, and EELV is intended to be a commercial service with necessary government insight to assure mission success.
 - However, in light of recommendations by the BAR and lessons learned from Heritage operations, the Air Force has determined that increased government participation is required during early years of the EELV program.
 - Increases in government participation will take the form of additional insight (not oversight) consistent with the current ORD.
 - Increased government participation will be applied throughout the program to support specific value-added tasks (i.e., OSS&E, factory surveillance, launch base surveillance, post flight analysis, etc.) and strengthen the contractors' overall system designs, single standard of quality, and processes.
- 2) A Consolidated Task Force (CTF) will be the single government interface at each launch base for EELV program activities.
 - Stakeholders will provide matrixed personnel to staff the CTF, but personnel will remain tied to their 'parent' organizations for administrative matters.
 - Initially, the CTF will report to SMC Commander through the SMC Detachments at the launch bases.
 - The specific CTF organizational structure and scope will be refined through pathfinder activities and approved by the SMC/CC.

- AFMC will provide the training program as developed by the EELV contractors from which AFSPC will develop the necessary certification program for appropriate members of the CTF and Range Squadrons.
 - Manning numbers to support the EELV program through all phases for Initial Launch Services (ILS) Surveillance activities will be refined during Pathfinder.
- 3) The Space and Missile Systems Center Commander (SMC/CC) certifies flight worthiness of the launch vehicle for all government missions.
 - 4) Mission Management for NRO missions shall be executed via USAF contracts, technical delegation agreements, personnel integrated into the EELV SPO and the CTF. Through this process all NRO launch support and mission unique requirements will be satisfied. The NRO will use established AFMC and AFSPC contracting processes and practices as much as practical.

1.4. Stakeholders

Execution of the EELV program will be an integrated team effort. The key stakeholders in the Program's success include: Assistant Secretary of the Air Force for Acquisition (SAF/AQ), Air Force Materiel Command (AFMC), Air Force Space Command (AFSPC), Defense Contract Management Agency (DCMA), EELV Contractors and the National Reconnaissance Organization (NRO). The following provides a brief description of how each stakeholder will contribute to the success of the EELV program.

NOTE: A Launch Executive Review Committee consisting of senior representatives from each of the above mentioned stakeholders and other organizations will also monitor and provide guidance regarding all government launch programs activities, including EELV transition activities.

1.4.1. SAF/AQ

SAF/AQ is the Service Acquisition Executive (SAE) and is responsible to OSD for the successful execution and management of the EELV program.

The Program Executive Officer for Space (PEO/SP) is responsible to the SAE for the successful execution (cost, schedule, performance) and management of the programs and their funding within the Space Portfolio, including the EELV program.

1.4.2. AFMC

AFMC is the acquisition command for USAF launch and USAF satellite systems. SMC is the AFMC product center responsible for this activity. The SMC Commander (SMC/CC) is specifically responsible for the flight worthiness certification process through the Operational Safety, Suitability and Effectiveness (OSS&E) program.

The EELV SPO, SMC/MV, is specifically responsible for the acquisition of EELV commercial launch services for USAF and NRO missions. In this capacity, the EELV System Program Director (SPD) reports to the PEO/SP. EELV SPD responsibilities also

include confirming to the flight certification authority (SMC/CC) that all EELVs meet OSS&E and flightworthiness certification criteria.

1.4.3. AFSPC

AFSPC is responsible for ensuring all operational requirements are in place and for executing launch operations. Daily operational planning is managed through the 45 and 30 SW at Cape Canaveral AFS and Vandenberg AFB respectively. AFSPC Wing Commanders are responsible for all range support assets, environmental compliance, range security, and public safety. The Wing Commander approves all contractor and Government hazardous operations to assure public safety and ensures resource safety of national assets. In addition, Wing Commanders act as Launch Decision Authority (LDA) during all launches involving their respective ranges.

1.4.4. DCMA

DCMA supports contract administration and provides independent assessments of contractor quality and manufacturing processes in direct support of acquiring agencies.

1.4.5. EELV Launch Vehicle Contractors

Lockheed Martin Astronautics and The Boeing Company are the EELV contractors responsible for providing a commercial launch service consistent with the requirements outlined in their initial launch service (ILS) contracts. Both contractors are responsible for developing their respective launch vehicle concepts consistent with the EELV ORD and acquisition strategy as documented in their respective EELV Other Transaction Agreements.

1.4.6. NRO

The NRO partners with the USAF to procure launch services, but maintains independent accountability, authority, and responsibility for its missions. The NRO Corporate Operations Office for Space Launch (COO/SL) has primary responsibility for NRO launch related functions, payload recovery, and is the single interface with NRO satellite programs. The NRO Director has designated the NRO's Corporate Operations Office, Director for Space Launch as Mission Director (MD) for all NRO missions.

1.5. Security

Security of EELV assets preserves our assured access to space and is critical to national security. Security issues are detailed within the EELV System Protection Guide and other policy documentation.

2. Transition Key Elements

This section provides a brief description of the key events and continuing activities having broad applicability to the program.

2.1. Timeline

The EELV transition period is the period when EELV surveillance and launch operations will occur concurrently with heritage surveillance and launch operations. Specifically, the transition period begins with the manufacture of the first EELV flight articles and continues through proven reliability and maturation of the EELV systems. Based upon current schedules, this time period is scheduled to run from late 2000 to mid-2006. It is anticipated that following the last heritage post-flight analyses, AFSPC's SLS structure and the launch vehicle organization within each SMC Detachment will be drawn-down. The CTF organization will be the remaining single government agent performing EELV launch base surveillance.

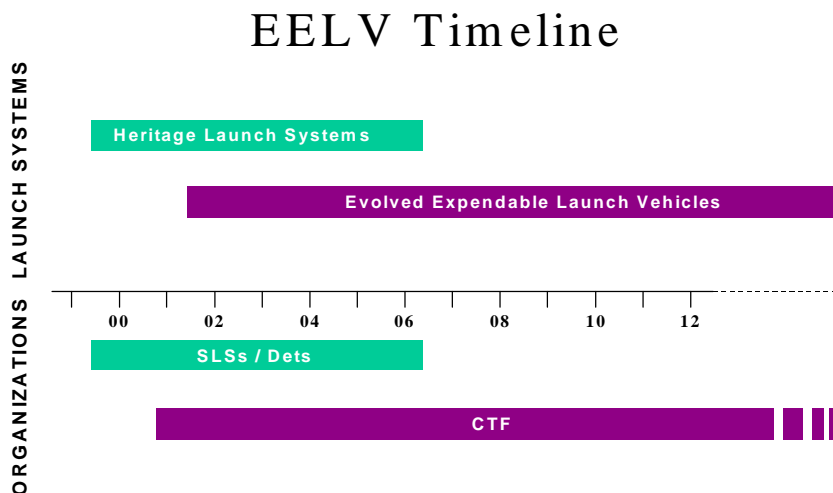


Figure 1. EELV Transition Timeline

Figure 1 shows the EELV Start-up and Transition schedule. During this period, EELV start-up activities will not differ significantly from EELV steady state. Start-up activities will be incremental in approach, ensuring all processes are not only well defined and in place for the first EELV missions, but that all processes are sufficiently proven and mature for EELV to transition to its end state. The areas addressed below outline the EELV program's overall approach toward attaining this goal while ensuring the highest level of mission success starting with the initial launch.

2.2. Key Transition Events

Figure 2 depicts key transition events that serve as markers for coordinating transition planning and activities.

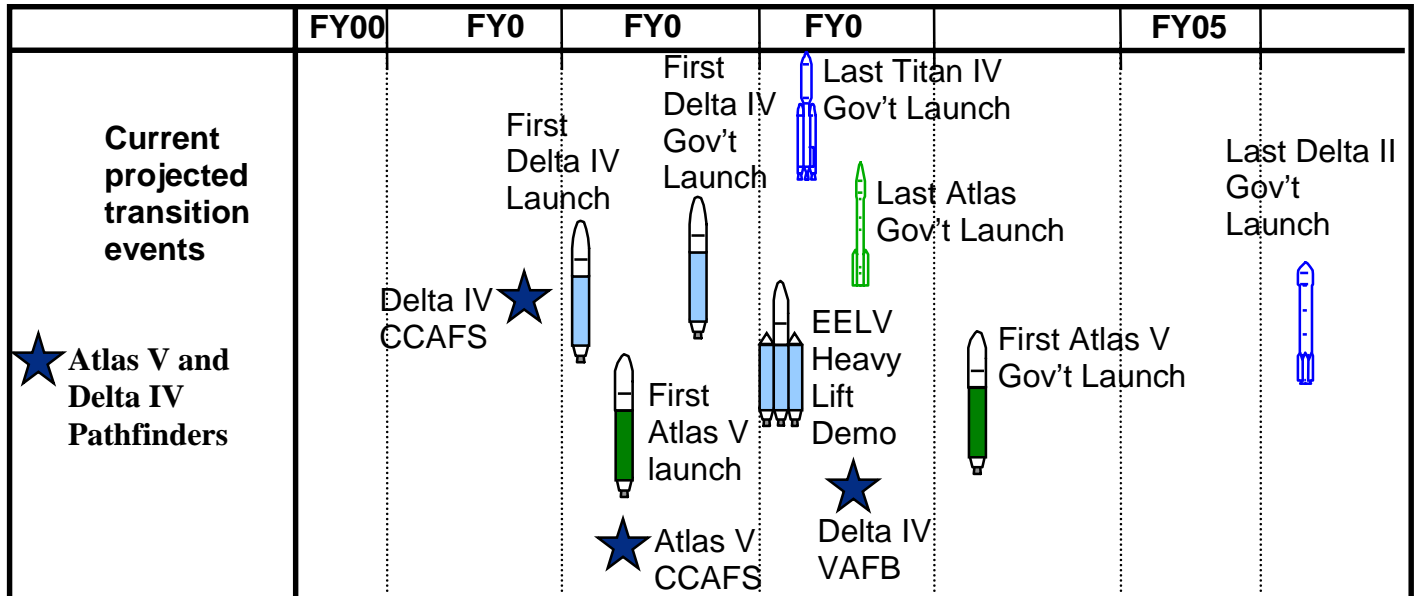


Figure 2: Key Transition Events

2.3. End-state

The EELV transition period end-state will be reached when the EELV stakeholders determine that EELV has exhibited sufficient reliability to be declared operational. The exact criteria for determining this point cannot be developed until the government has gained significant experience in EELV launch operations. When this stage of maturity is reached, the government will reassess its role and level of participation. For this transition end-state, AF intends to comply with requirements as described in the EELV ORD.

The Air Force will build confidence in the EELV capability through the rigorous surveillance and OSS&E processes. These efforts will ensure repeatability and consistency of contractor processes from manufacturing through launch operations. The EELV OSS&E Plan and EELV Master Surveillance Plans will address these processes in detail.

2.4. Flight Readiness/Worthiness Approach

Prime goals of the EELV transition are to minimize overall development risk, while maximizing mission success. These goals will be accomplished through the OSS&E, Integrated Mission Assurance and Risk Management measures described in the following paragraphs.

2.4.1. EELV OSS&E Process

SMC/CC is responsible for OSS&E for EELV. SMC/CC directs the activities of the Independent Risk Assessment Team (IRAT) and its resources (AFPEO/SP will provide funds will provide associated resources to SMC/CC, funds to be budgeted by the EELV SPD). SMC/CC OSS&E responsibilities include:

- Approval of the OSS&E plan written by the EELV SPD
- Independent verification of the design integrity, systems engineering process, and mission assurance processes planned for the program—SMC/CC has a continuous responsibility to monitor the design integrity and manufacturing processes to ensure that OSS&E criteria are met.
- Flight Worthiness Certification and Chair of the Flight Readiness Review
- Final approval of the OPCON transition point
- Approval of mission specific Launch Services Plans
- Initially, the CTF will report to SMC Commander through the SMC Detachments at the launch bases. (The specific CTF organizational structure and scope will be refined through pathfinder activities and approved by the SMC/CC)
- Appointment of the Mission Director
- Chair the Flight Readiness Review
- Participate in PEO portfolio reviews (PPR), SAF/AQ portfolio reviews and support any AFMC requested reports as necessary

During the EELV transition period until the EELV system is fully mature, there will be additional government analyses of the launch vehicles over and above the standard reviews with the contractors. The PEO is responsible for the performance and funding of these additional IV&V activities. The plan for these IV&V reviews will be documented in the EELV OSS&E Plan and mission specific Launch Services Plans that are approved by the SMC/CC.

The EELV program supports the AFMC/SMC OSS&E and Flight Worthiness Processes through an Integrated Mission Assurance Process. The EELV integrated mission assurance activities combine the mission success related activities performed by the launch service contractor, SPO, and Mission Director's independent risk assessments conducted by the SMC IRAT or NRO Mission Assurance Team (MAT). The integrated mission assurance activities culminate in a formal Flight Readiness Review conducted by the SMC/CC. At the FRR, the SPO and IRAT/MAT present the results of their respective flight worthiness verification and mission assurance activities and obtain a Flight Worthiness Certification and approval to proceed into final launch operations. The interrelationships in the process are depicted in Figure 4. The Integrated Mission Assurance Plan defines the entire process and specific functions in detail.

2.4.2. Integrated Mission Assurance

The EELV SPO and launch contractors produce the baseline documents for executing the EELV mission assurance/launch verification process. The IRAT/MAT will use data and

information from the both government and contractor sources to determine where they will focus their efforts (see Figure 3).

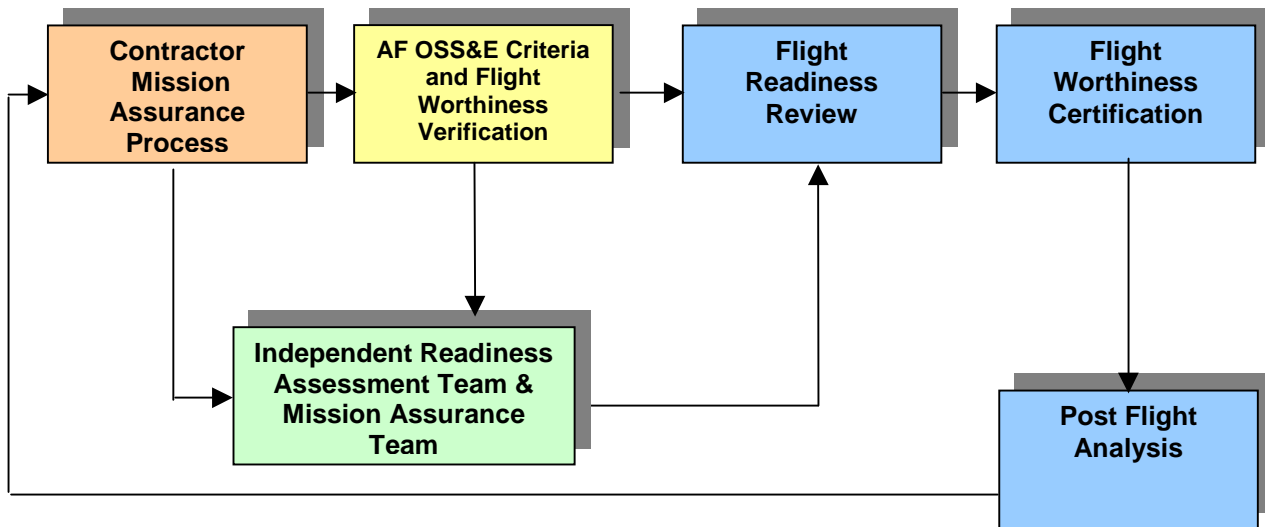


Figure 3. OSS&E Support Approach

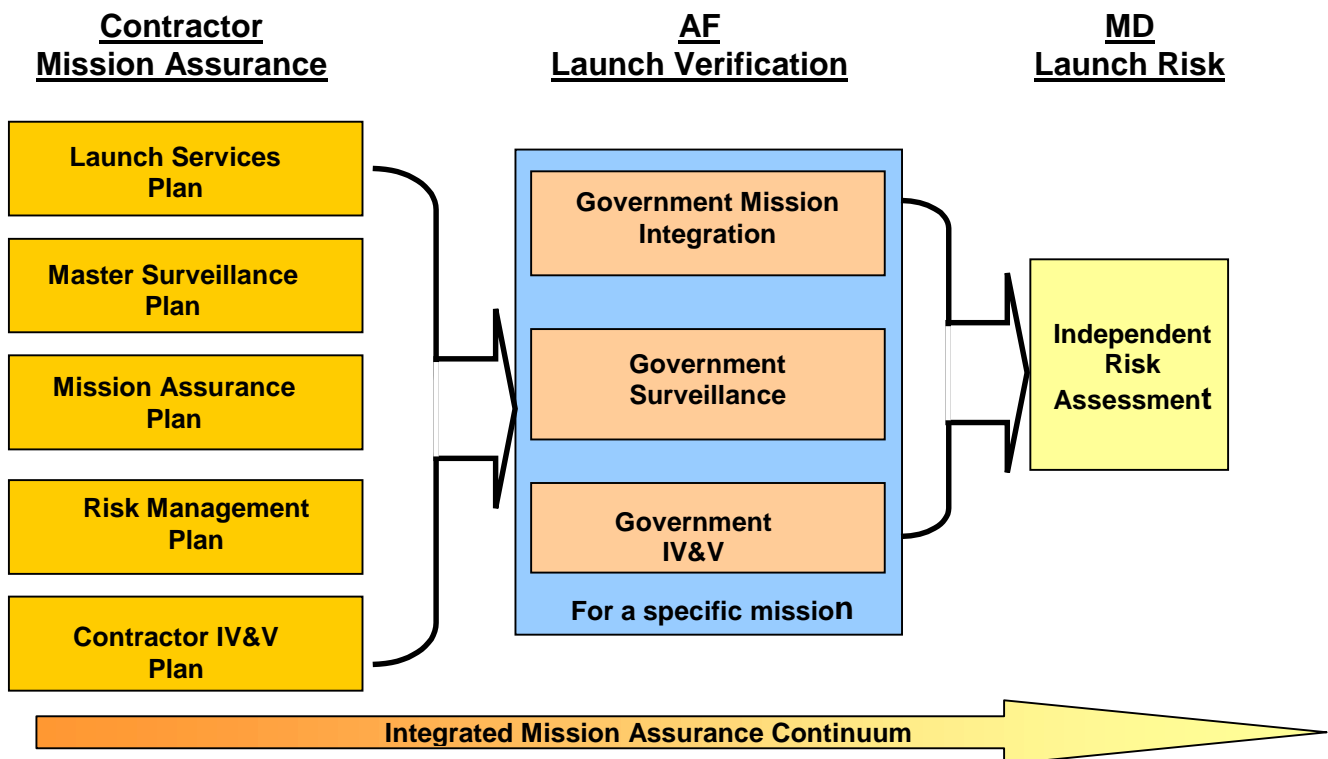


Figure 4. Integrated Mission Assurance Process

For NRO missions, the NRO will initially conduct its own MAT and IV&V programs. The NRO retains responsibility for its missions but shares responsibility with the EELV

SPO for flight worthiness of the space launch vehicle. The USAF and NRO will work to evolve to standard mission assurance functions.

2.4.3 Risk Management Approach

The EELV Risk Management Approach is to:

- Identify risks early, and implement corrective actions or risk mitigation plans
- Maintain multiple contractors, creating a competitive commercial environment
- Establish the incentives and operating environment between the contractor and the government
- Integrated government/contractor teams
- Clear and open communication that permits sharing of proprietary program data among all team members

The EELV system was designed as a flexible system of two distinct families of vehicles giving assured access via redundant capability. These two families of vehicles provide a wide range of launch options as well as an interface standard to allow transfer of payloads between EELV families. In addition, call-up times have been reduced to add flexibility to contingency planning requirements and launch processing. Short on-pad cycle times will increase launch throughput. The government's overall EELV requirements were developed to closely mirror and complement commercial capabilities to allow rapid substitution of launch vehicles in the event of a national emergency. However, the EELV launch service contracts have been structured to provide for contingency back-up launch capability should one of the EELV contractors be unable to support government launch needs.

Another key part of the EELV risk management approach is aggressive application of lessons learned from heritage programs and EELV post flight analyses into the EELV design, processes and practices. A lessons-learned database will be maintained and common lessons shared between government and contractor organizations, as appropriate. This effort will greatly improve communications between all organizations, educate new personnel, and in total improve the quality of the EELV surveillance and OSS&E processes. This program will start with production and continue through post flight.

2.5. Training

A comprehensive training program will be developed to ensure government personnel are prepared to participate in EELV launch vehicle manufacturing, surveillance and operations for all aspects of the 24-month EELV launch campaign process. The respective contractors will update and control training program configurations to ensure accuracy of materials as design changes and lessons-learned are incorporated.

AFSPC Mission-Ready (MR) and mission support personnel will require additional training and evaluation in order to comply with requirements defined in AFSPCI 36-2202

(Mission-Ready Training and Evaluation Requirements) and the Career Field Education and Training Plan (CFETP). This additional training will be made available to, but will not be mandatory for, other launch community personnel.

Pathfinder will validate the thoroughness of the EELV training program and shall serve as validation of the initial certification program. Following pathfinder, all applicable guidance, training materials, tools, and processes will be reviewed to determine if changes are required.

2.6. Process Improvements

A complete review of the status of the EELV contractors EMD programs by the SECAF directed Joint Assessment Team was accomplished with participation from the Government, The Aerospace Corporation, and outside expert consultants and contractors. A summary of their findings, recommendations and the actions taken to assure further process improvements follows:

2.6.1. Systems Engineering – Requirements Allocation:

The contractor's requirements allocation processes were evaluated and determined to be sound and functioning properly. Additional government resources (Aerospace) were recommended and have been added to increase participation and support final validation of the requirement process.

2.6.2. Systems Engineering – System Design:

The contractors' design practices and design solutions & analyses were evaluated and determined to provide reduced parts counts and reduced single point failures, and added redundancy and design margin, significantly enhancing reliability. The contractor's design qualification plans were reviewed and found to be sound. Additionally, Aerospace was tasked to verify the contractor's qualification test plans and predicted flight environments, and the government partnered with industry to improve the operating margins of the RL-10 upper-stage engine common to both designs and eliminate chronic production problems. Additional Aerospace resources have been added to accomplish these tasks.

2.6.3. Systems Engineering – System Test:

The contractor's test plans were evaluated and determined to be appropriate. Cases of qualification by similarity and analyses were endorsed, qualification tests were endorsed, primary structure ground tests and full-scale separation joints testing were evaluated and booster "hot fire" tests were evaluated. Contract modifications were made to ensure both EELVs would conduct a "hot fire" test.

2.6.4. Systems Engineering – Software:

The contractor's processes were evaluated and a need for more thorough IV&V was identified and laid into the development plans. Additional resources will be identified to accomplish this effort.

2.6.5. Manufacturing and Product Assurance:

The contractor's processes were evaluated and determined to be 6 sigma equivalent programs that will institute a new center of manufacturing excellence for the space launch industry. Contractors emphasized plans for design, manufacturing, and change-management integration. The government identified the EELV SPO product team to aid technical insight.

2.6.6. Subcontract/Supplier Management:

The contractor's plans for subcontract management were evaluated. The SPO and SAF/AQ will conduct detailed assessments of the subcontract management plans in the future.

These actions reinforced the disciplined engineering process called for in the OSS&E Plan. The contractors have instituted these processes and government insight activities have monitored the execution at an appropriate level. The IPT teams have confirmed satisfactory contractor execution of the SRR, SDR, PDR, CDR and qualification testing.

2.7. Resources

2.7.1. EELV SPO Manpower

Current SPO manpower is estimated to be sufficient to complete the remaining development activities through FY03. As the initial launch service surveillance activities ramp-up, an overall EELV resource plan is required detailing each stakeholder's requirement. The areas where additional resources may be required are mission management, factory surveillance, mission assurance, IV&V, launch base processing, launch execution, and post-flight analysis. Table 1 is a forecast of those SPO requirements.

	Today	FY 01	Delta	FY 02	Delta	FY 03	Delta	FY 04	Delta	FY 05	Delta	FY 06	Delta	FY 07	Delta
SPO-Civilian	15	15		15		15		15		15		15		15	
SPO-Mil	68	68		68		68		68		68		68		68	
SPO Aero	90	95	5	100	10	100	10	100	10	100	10	100	10	100	10
SPO SETA	25	25		35		35		35		35		35	0	35	
TBC Fac-SPO-Mil	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
TBC Fac-Aero	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
TBC Fac-DCMA	12	12	0	12	0	12	0	12	0	12	0	12	0	12	0
LM Fac-SPO-Mil	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LM Fac-Aero	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LM Fac-DCMA	13	13	0	13	0	13	0	13	0	13	0	13	0	13	0
STARS-O&M	10	10	0	14	4	16	6	18	8	18	8	17	7	16	6
STARS-Ops	0	5	5	10	10	15	15	15	15	20	20	20	20	20	20
Post-Flight	0	5	5	5	5	10	10	10	10	10	10	10	10	10	10
Total Organic	233	256	23	280	37	292	49	294	51	299	56	298	55	297	54

Table 1. SPO Manpower Requirements

In addition to the SPO requirements shown in Table 1, technical resources (primarily FFRDC) will be added for early IRAT and Mission Assurance support.

2.7.2. CTF Manpower

AFSPC performed an initial assessment of AFSPC CTF manning requirements and determined the AFSPC contribution to the Cape Canaveral and Vandenberg CTFs should be between 75 and 160 personnel in addition to personnel from other organizations. The EELV Pathfinder experience will be used to enhance the CTF staffing requirements and procedures. AFSPC, AFMC and the NRO will form a Launch IPT to refine manning estimates. The Launch IPT will complete an estimate of overall CTF manpower requirements and will identify appropriate opportunities and skills required for government participation and insight. To refine the initial resource requirements, the Launch IPT will review contractor-generated:

- Launch Support Plans and timelines
- Manufacturing/surveillance plans
- Post-flight analysis requirements.

The Launch IPT will complete its initial findings to all stakeholders within 60 days after publication of this plan. The Launch IPT will perform a follow-up review of manpower requirements after the first government EELV launch (scheduled for late FY02).

3. EELV Transition Lifecycle

This section describes the government's roles during the period when EELV systems are being brought on line as well as steady state.

3.1. Authority and Accountability

At the transition from the generation phase to the execution phase, OPGON of USAF or COCOM Missions will transfer from AFMC (the SMC/CC) to AFSPC (the LDA). At this point, all the activity on the launch range is geared toward the execution of the launch, rather than the launch vehicle assembly, and one clear line of authority to the LDA is required for the entire launch effort. CTF will become the direct conduit for information to both the LDA and MD and will also provide the Air Force Launch Director (AFLD) during countdown operations. The EELV stakeholders, based on outcome of early Pathfinder operations, will determine exact timing of OPGON transfer for government EELV missions.

3.2. Mission Management

Each EELV mission is managed via a commercial Launch Service Plan that outlines the 24-36 month campaign process and establishes a single integrated government chain of command for all launch campaign surveillance, operations and mission assurance. The mission specific launch services plan is a day-to-day list of all specific mission integration activities that must be accomplished prior to launch. It gives the EELV stakeholders visibility and insight into all tasks required for successfully launching that mission. It is both comprehensive in scope and detailed in structure. It provides the framework for the SMC Independent Risk Assessment Team (IRAT) and the EELV SPO IV&V processes to perform their independent roles as well as setting a clear baseline for all mission unique activities.

3.2.1. Contractor Role

EELV contractors prepare the mission specific Launch Service Plan and support mission management as part of comprehensive launch services.

3.2.2. Government Role and Responsibilities

The EELV SPO leads the mission management phase. For all missions, the satellite program office (USAF or NRO), EELV SPD, the launch services contractor, and SMC/CC, in the role as the flight worthiness certification authority, will approve the mission specific Launch Services Plan for each government mission. The NRO retains responsibility for its missions and will lead the integration activity.

The Mission Director (MD) closely monitors all mission assurance activities from mission inception through launch and gives the LDA "go for launch" for vehicle stack. The SMC/CC will appoint the MD for all COCOM missions. Other payload owners will designate the MD for their missions.

3.3. Factory Production

Factory production encompasses all activities accomplished at both EELV prime contractor facilities and major subcontractor facilities. During the production phase, government personnel will conduct surveillance of the contractor processes at the factory, sub-contractor facilities.

3.3.1. Contractor Role

EELV contractor plans and executes all factory production activity as part of comprehensive launch services plan consistent with their respective contractor master surveillance plans and mission assurance plans.

3.3.2. Government Role & Responsibilities

DCMA is a DoD organization that provides quality assurance and production surveillance support at both EELV manufacturing facilities. It receives a specific delegation from the EELV SPD via MOAs to directly support this requirement as part of the overall joint surveillance program. DCMA's expertise maintains a consistent focus on manufacturing processes and provides the EELV SPO an on-site, independent evaluation of contractor performance and compliance. DCMA personnel will be assigned to the CTFs to ensure consistent quality assurance practices are being performed.

3.4. Launch Base Processing

Launch base processing begins with the arrival of booster flight hardware at the launch base. Activities include final booster assemble and check, payload mating, integrated systems test. Refer to contractor Launch Services Plans for details on each system's process flows.

3.4.1. Contractor Role

EELV contractor plans and executes all launch base processing as part of comprehensive launch services.

3.4.2. Government Role & Responsibilities

The Space Wings and EELV Consolidated Task Forces (CTF) at each launch base will execute the government's role.

3.4.2.1. Space Wing Roles for EELV Launch Base Processing

Provide operational resources to the CTF. Provide launch base support to contractors in accordance with launch base support agreements. Operate the launch ranges.

NOTE: For EELV, AFSPC will not need to maintain the space launch complexes since the EELV contractors have sole responsibility for O&M of their launch sites and leased property.

3.4.2.2. CTF Roles

- Surveillance of all contractor launch base operations
- Support MDs and LDAs in providing "Go" for launch

- Liaison between SPOs and launch bases
- Facilitate communications between contractors and the Space Wings

3.4.2.3. CTF Mission

The CTFs are an integral part of the government's overall surveillance process. As the single face to the launch service contractors, it will focus on launch site activities to ensure safe, reliable, timely, and cost effective processing of all EELV launch services. This includes supporting the Launch Decision Authority's (LDA) responsibility to ensure public safety and resource safety. The CTFs will maintain sufficient involvement in EELV launch-base activities to:

- Enable EELV SPD to execute Single Manager, OSS&E and space flight worthiness responsibilities
- Enable the SMC/CC to determine space flight worthiness of each launch vehicle
- Enable the Space Wing Commanders to execute public safety duties, as well as LDA responsibilities
- Allow the Mission Director (MD) to assess mission assurance probabilities and take risk mitigation measures as needed
- Perform launch base contractor surveillance during final vehicle assembly, payload encapsulation and mate, integrated test, and launch

During launch campaigns, the CTF will actively support the EELV SPD during vehicle processing and the MD and LDA during launch operations. For NRO missions, the CTF will support the NRO MD throughout the mission life cycle.

3.5. Launch Execution

Launch execution begins with successful completion of an integrated systems test. Refer to contractor Launch Services Plans for details on the execution flows for each system.

3.5.1. Contractor Role

EELV contractor plans and executes all launch operations as part of comprehensive launch services.

3.5.2. Government Role & Responsibilities

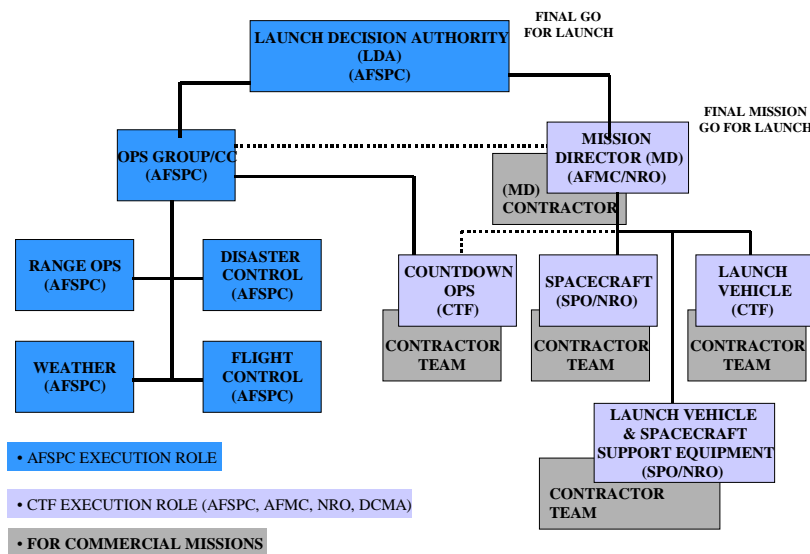
The CTF will support EELV contractor and range countdown operations, and advise the MD and LDA to allow the USAF to maintain positive control of missions and to ensure public safety. The CTF will also provide mission planning, program integration, operational control and engineering management for DoD missions. In the execution phase, mission ready CTF operators will conduct surveillance of contractor launch operations and provide coordination with the Range Squadron, Weather Squadron, and Wing Safety personnel.

Figure 5 depicts the Day of Launch Decision Process. Solid lines represent chain of command, while dotted lines indicate communications only. Although decision

authorities change from government to commercial launches the CTF's role and responsibilities remain largely the same for both.

The LDA assures launch readiness of the range and ground systems to support the mission. The LDA also has the final authority for “go for launch” decisions and contingency activities.

DAY OF LAUNCH (DOL) DECISION PROCESS



Solid lines = Control Dotted lines = Info only

Figure 5. EELV Decision Process on Launch Day.

After certifying flight worthiness, the SMC/CC continues to monitor technical performance through the MD who is intimately involved with all final launch-processing activities and gives the “go for launch” from the mission perspective to the LDA. For NRO missions, EELV SPD provides a flight worthiness recommendation to the SMC/CC, who in-turn provides a certification to the senior NRO official at the FRR. The NRO MD certifies mission readiness to the LDA for the final “go” in countdown operations.

3.6. Post Flight Analysis

Post Flight Analysis phase begins with completion of launch execution. The first EELV launches will fly an added suite of “heavy instrumentation” to adequately assess all critical flight environments and establish a configuration baseline. This extra instrumentation is in addition to the baseline vehicle instrumentation systems, which provide 2 to 4 times the data as Heritage systems. Early EELV flights are manifested to fly real missions, but may be flown as demonstration flights if required. This will help in characterizing all key flight parameters and continue building confidence in reaching the desired flight reliability. Based on Heritage systems data, it takes between 10-15

launches to reach a point of hardware maturity. The first Delta IV heavy lift vehicle (HLV) launch is planned as a demonstration flight to validate and demonstrate all the critical parameters for these demanding missions. Heritage lessons learned from Titan IV will be considered in the planning of this flight.

3.6.1. Contractor's Role

Post flight analysis is part of the EELV launch service. The contractor will facilitate data collection, dissemination, and reduction according to the program plan.

3.6.2. Government Role & Responsibilities

Data from all EELV missions will be added to a centralized database managed by the Aerospace Corporation through their STARs facility and will be used to envelop flight-to-flight variations and support system trend analysis.

3.7. Recovery

Recovery operations begin immediately after launch execution.

3.7.1. Contractor Role

EELV contractor plans and executes launch recovery operations on all facilities for which they are responsible as part of comprehensive launch services. The contractor refurbishes the launch complex, performs functional checkouts, and secures the pad. Refer to the Launch Services Plans for details.

3.7.2. Government Role & Responsibilities

AFSPC fire protection assets control incidental fires caused during lift-off. Additionally, range safety, security and bioenvironmental resources will support contractor launch base recovery as required.

Definitions

Air Force Mission Integration: The AF Mission Integration process is responsible for defining the standard and mission unique requirements, monitoring the contractor's progress, reviewing mission designs, analyses, plans, tests, operating procedures, and schedules.

Air Force Master Surveillance Plan: The AF Master Surveillance Plan includes all component elements of monitoring, evaluation, and reporting of contractor activities as well as other functions the government must perform to assure successful launch service execution. These include: supplier surveillance; prime contractor factory surveillance; launch site surveillance; post-flight and trend analysis (STARS); safety planning; security planning; environmental impact analyses; training programs; and pathfinder activities. The AF Master Surveillance Plan defines the locations, personnel, processes, and operations being monitored by the government team. The EELV OSS&E Plan will identify the appropriate data to be extracted from the above surveillance activities to support the SMC/CC flight worthiness certification decision.

Air Force IV&V Plan: The EELV SPO will implement through Aerospace an IV&V program to independently evaluate critical contractor analysis and modeling data. This effort includes both non-recurring and recurring IV&V and provides the SPO added confidence in the output of the contractors analytical tools.

Contractor Master Surveillance Plan: The contractor developed Master Surveillance Plan captures the management control processes from design to manufacturing, subcontract/supplier management, launch base operations and post-flight. The Master Surveillance Plan maps the requirements flow from the system design and identifies critical design and single point failure items down to the hardware and software components. This mapping aids determination of the level of surveillance required to ensure mission success. In addition, the Master Surveillance Plan establishes the level of surveillance associated with all parts of the production program from sub-tier suppliers to the launch site. The Contractor Master Surveillance Plan forms the basis for government surveillance activities by identifying product flows, process capabilities and controls, technical data content and sources, and management documentation.

Contractor Mission Assurance Plan: The contractor's Mission Assurance Plan defines an orderly process wherein the contractor assures itself and its customers that the mission definition, vehicle design, vehicle production, launch site processing, and range activities are certified to accomplish the mission successfully. The Mission Assurance Plan integrates the systems engineering, manufacturing and quality assurance, and launch site processing, functions, as identified in the contractor's Master Surveillance Plan, with the requirements of a specific mission. It presents a cohesive process for verifying the as-built vehicle configuration and determining hardware/software integrity for a particular

mission. This results in an orderly procedure for launch vehicle integrity and readiness verification by the contractor to the SPO prior to Flight Worthiness Certification.

Contractor Risk Management Plan: The Risk Management Plan provides for early identification of risks, corrective actions, or mitigation plans. The contractor's Risk Management Plan defines the process for identifying significant risks, analyzing impact of these risks, assessing mitigation options, implementing mitigation plans, and tracking the status of risk items. The Risk Management Plan results in a Risk Mitigation Report, which defines and prioritizes each program risk item based on probability of occurrence and severity of impact to the program and tracks mitigation activities to closure.

Contractor IV&V Plan: The contractor's IV&V Plan defines the internal IV&V process used by the contractor to validate/verify the launch system design and critical software. Contractor managed IV&V includes both non-recurring/recurring and in-house/subcontracted independent verifications and validations.

Government Insight versus Oversight: While exercising the government's insight role, government personnel may perform contractor surveillance, and participate in launch preparation, planning and execution. However, persons exercising insight do not have any directive authority over the contractor. Under the EELV Program, the government does not accept delivery of hardware or software, only launch services. The government will maintain adequate visibility and insight into all tasks required to successfully launch each mission.

Mission Specific Launch Services Plan: The contractor Launch Services Plan lists all mission specific integration activities to be accomplished prior to launch. It provides visibility and insight into all tasks required to successfully launch the mission. The Launch Services Plan documents the implementation details by providing an integrated tool that combines the standard mission integration schedule with detailed definitions of tasks, products, events, customer/contractor inputs, review milestones, and deliverables.

OPCON: Transferable command authority that may be exercised by commanders at any echelon at or below the level of combatant command. (Joint Pub 1-02)

Acronyms

AETC	Air Education and Training Command
AFB	Air Force Base
AFI	Air Force Instruction
AFMC	Air Force Materiel Command
AFOTEC	Air Force Operational Test and Evaluation Command
AFSPC	Air Force Space Command
AFSPC/DO	Air Force Space Command/Directorate of Operations or Operations Officer
BAR	Space Launch Vehicles Broad Area Review
BOS	Booster On Stand
CCAFS	Cape Canaveral Air Force Station
CCB	Configuration Control Board
CDR	Critical Design Review
COCOM	Combatant Command
CTF	Consolidated Task Force
DAC	Designated Acquisition Commander
DAE	Defense Acquisition Executive
DCMA	Defense Contract Management Agency
DDNRO	Deputy Director, National Reconnaissance Office
DoD	Department of Defense
DSP	Defense Support Program
EELV	Evolved Expendable Launch Vehicle
ELV	Expendable Launch Vehicle
ERB	Engineering Review Board
FFRDC	Federally Funded Research and Development Corporation
FRR	Flight Readiness Review
GIDEP	Government-Industry Data Exchange Program
GN&C	Guidance, Navigation, and Control
GSE	Ground Support Equipment
GSE&I	General Systems Engineering & Integration
HAR	Hardware Acceptance Review
HLV	Heavy Lift Vehicle
ICD	Interface Control Document
IPT	Integrated Process Team
IQT	Initial Qualification Training
IST	Integrated System Test
IUS	Inertial Upper Stage
IV&V	Independent Verification & Validation
JAT	Joint Assessment Team
JMSP	Joint Master Surveillance Plan
LAAFB	Los Angeles AFB
LD	Launch Director
LDA	Launch Decision Authority
LRR	Launch Readiness Review
LSP	Launch Services Plan
MAR	Monthly Acquisition Review
MAT	Mission Assurance Team
MD	Mission Director
MIWG	Mission Integration Working Group

MLV	Medium Lift Vehicle
MOA	Memorandum of Agreement
MR	Mission-Ready
MRR	Spacecraft Mission Readiness Review
NASA	National Aeronautics and Space Association
NDI	Non-Destructive Inspection
NRO	National Reconnaissance Office
OGV	Operations Group Standardization and Evaluation
ORP	Operations Review Panel
OSL	Office of Space Launch
OSS&E	Operational Safety, Suitability, and Effectiveness
OTA	Other Transaction Agreement
PDR	Preliminary Design Review
PEO	Program Executive Officer
PMD	Program Management Directive
PMR	Program Management Review
PPR	PEO Portfolio Review
QAE	Quality Assurance Evaluators
RANS	Range Squadron
RF	Radio Frequency
SAF/AQ	Secretary of the Air Force/Acquisition
SAF/AQS	Secretary of the Air Force/Acquisition for Space
SAWG	Site Activation Working Group
SDR	Software Design Review
SETA	Systems Engineering and Technical Advisory
SLC	Space Launch Complex
SLS	Space Launch Squadron
SLV	Space Launch Vehicle
SM	Single Manager
SMC	Space and Missile Systems Center
SPD	System Program Director
SPO	System Program Office
SRMU	Solid Rocket Motor Upgrade
SRR	Systems Requirements Review
STARS	Space Launch Operations Telemetry Acquisition and Reporting System
SW	Space Wing
SW/SE	Wing Safety
TAG	Tested and Guaranteed
TCDR	Tailored Critical Design Review
TRG	Training Group
TSPR	Total System Performance Responsibility
USAF	United States Air Force
VAFB	Vandenberg AFB
VLC	Verification Loads Cycle
WS	Weather Squadron
WSDR	Wrap-up System Design Review

References

1. EELV Operational Requirements Document
2. AFI 10-1211 Space Launch Operations
3. AFI 10-XXXX EELV Launch Operations (Dec 2000)
4. AFI 63-12 Assurance of Operational Safety, Suitability, and Effectiveness
5. AFI 63-1201 Assurance of Operational Safety, Suitability, and Effectiveness for Space and Missile Systems
6. AFD 63-15 USAF Space Flight Worthiness Certification
7. Boeing Delta IV Launch Services Plan
8. Lockheed Martin Atlas V Launch Services Plan
9. Launch Programs Risk Management Plan (Nov 2000)
10. AFSPCI 10-1208 Spacelift Operations (2 Jan 98)
11. AFSPCI 10-1213 Spacelift Launch Strategy and Scheduling Requirements (2 Oct 00)
12. AFSPCI 10-1215 Support to Commercial Space Launch Activities (2 Aug 99)
13. AFSPCI 21-0108 Maintenance Management of Space Launch Systems (21 Mar 98)
14. AFSPCI 36-2202 Mission Ready Training, Evaluation and Standardization Program (2 Aug 99)
15. AFSPCI 36-2203V1 14 AF Training and Evaluation Performance Standards (TEPS) (1 Jun 98)
16. CFETP Career Field Education and Training Plan (for 2MOX1, X2, and X3 Personnel)
17. EWR 127-1 Range Safety Requirements (31 Mar 95)
18. Launch Programs Risk Management Plan [Heritage systems] (Nov 00)
19. EELV System Protection Guide